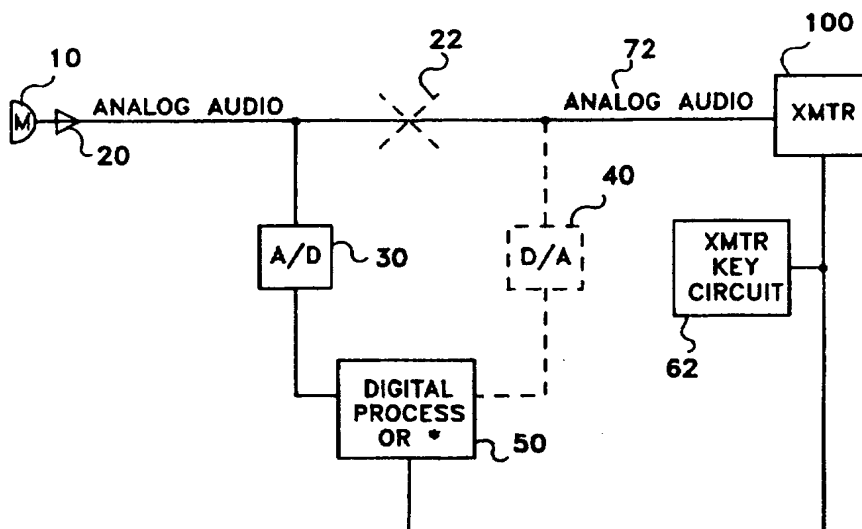




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(54) Title: VOICE ACTIVATED TRANSMITTER SWITCH



## (57) Abstract

This invention comprises an improvement in radio microphone systems commonly found in emergency vehicles such as police, fire ambulance, etc. It entails automatically turning the microphone (10) on with the voice of the user thereby obviating the manual push to talk switch commonly found on such microphones (10). The best mode embodiment comprises use of two microphones (10) generally 180 degrees apart, the output of which is applied to plus and minus inputs of a differential amplifier (20). The output of the differential amplifier (20) is then passed through an A/D converter (30) and is then digitally processed to authenticate the speaker and/or the speech. The digital processor (50) authenticates by comparing speech envelopes and harmonics etc. before activating the transmission.

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**VOICE ACTIVATED TRANSMITTER SWITCH**

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**TECHNICAL FIELD**

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This invention relates to the technical field of authenticated voice activated transmitter switches.

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**BACKGROUND**

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This invention relates to an improvement in radio microphone systems commonly found in emergency vehicles such as police, fire ambulance etc. Many accidents have been caused in emergency vehicles while returning the microphone to its hold position because the driver could not locate the home position without taking the eyes off the road.

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This invention entails automatically turning the microphone on with the voice of the user thereby obviating the manual push to talk switch commonly found on such microphones. Two sets of voice commands are generated for each operator one to turn the transmission on and the other to turn the transmission off. For added security the voice print/signature of a few authorized people is stored in the system such that unauthorized people are not able to interrupt the system.

1           The unit provides for the training of the system by each  
2           operator. The voice switch is interface and plug compatible  
3           with existing push to talk switch found on microphones in  
4           emergency vehicles.

5  
6           PRIOR ART

7           The prior art method of using the transmitter in an  
8           emergency vehicle requires the driver to use one hand to both  
9           hold the microphone and to push the PUSH-TO-TALK switch on the  
10          side of the microphone provided for this purpose to activate  
11          the transmitter.

12          This leaves only one hand to operate the vehicle and to  
13          concentrate on where the hand microphone is and how to control  
14          its movement. This effectively reduces the driver's ability to  
15          operate the motor vehicle while concentrating on the more  
16          important task of handling the emergency.

17          This in turn very substantially increases the risk of  
18          accident and injury to the driver and to other people in the  
19          area when the vehicle is in pursuit of another vehicle in  
20          high speed chase. When the emergency vehicle has an accident,  
21          two new emergency vehicles are dispatched one to handle the  
22          emergency vehicle and the other to handle the situation to  
23          which emergency vehicle was assigned to handle before the  
24          mishap. A preliminary prior art search was conducted and  
25          furthermore the inventor is intimately familiar with the  
26          problem and the prior art.

1           There is plethora of prior art on speech and speaker  
2           recognition and hence the ability to automatically activate  
3           and deactivate electronic devices such as a camera, dictation  
4           recorder, telephone answering machine, the automobile etc etc.

5           Following are typical examples of the closest U S patent  
6           as prior art arranged in the reverse chronological order.

7           12) U S Patent 5,267,323 granted to Toshiyuki Kimura on  
8           November 30, 1993 for "Voice Operated Remote Control System"

9           11) U S Patent 5,214,707 awarded to Fujimoto et al on  
10          May 25, 1993 for "Control System for Controlling Equipment  
11          provided inside a Vehicle Utilizing a Speech Recognition  
12          Apparatus".

13          10) U S Patent 5,008,954 bestowed upon Carl Oppendahl on  
14          April 16, 1991 for "Voice Activated Radio Transceiver".

15          9) U S Patent 4,961,177 granted to Kensuke Uehara on  
16          October 2, 1990 for "Method and Apparatus for Inputting A  
17          Voice through A Microphone"

18          8) U S Patent 4,905,270 earned by Hideyo Ono on  
19          February 27, 1990 for "Vehicular Hands Free Telephone System"

20          7) U S Patent 4,901,354 obtained by Gollmar et al on  
21          February 13, 1990 for "Method of Improving the Reliability of  
22          Voice Controls of function Elements and Device for Carrying  
23          Out this Method".

24          6) U S Patent 4,827,520 secured by Mark Zeinstra on May  
25          2, 1989 for "Voice Actuated Control System for Use in a  
26          Vehicle"

1           5) U S Patent 4,797,924 granted to Schnars et al. on  
2           January 10, 1989 for "Vehicle Voice Recognition Method and  
3           Apparatus".

4           4) U S Patent 4,401,852 given to Noso et al on August 30,  
5           1983 for Voice Response Control System".

6           3) U S Patent 4,119,797 conferred upon Walter C. Wollert  
7           on October 10, 1978 for "Voice Operated Switch Having an  
8           Activation Level which is Higher than its Sustaining Level"

9           2) U S Patent 3,746,789 awarded to Ernesto Alcivar on  
10          July 17, 1973 for "Tissue Conduction Microphone Utilized to  
11          Activate a Voice Operated Switch".

12          1) U S Patent 3,730,995 bestowed upon Max Vernon Mathews  
13          on May 1, 1973 for Voice Switched Microphone Control System".

14          The applicants are also aware that several companies such  
15          as Dragon Systems manufacture and market voice activated  
16          software systems for the end user.

17          Prior art patents disclose the general concept of voice  
18          activated electronic devices even voice activated switches but  
19          not in the configuration of a voice activated radio  
20          microphone, let alone one meeting all of the objectives  
21          established by the inventor for this invention as disclosed  
22          above.

23          The applicants are first to disclose a simple automatic  
24          replacement of the push to talk switch on radio microphones  
25          found in emergency vehicles.

1           Unfortunately none of the prior art devices singly or  
2           even in combination meet all of the objectives established by  
3           the inventor for this voice activated radio microphone.

4           OBJECTIVES

5           1. The main objective of this invention is to provide a  
6           simple, low cost, hands free operation of a two way radio such  
7           that the microphone push to talk switch function normally used  
8           in two way emergency mobile radios to turn the transmitter on  
9           and off is replaced by a recognized voice command.

10          2. Another objective of the invention is to prevent  
11          emergency vehicle accidents caused while accessing or  
12          returning the microphone to its hold position because driver  
13          is unable to handle the mike and the concomitant push-to-talk  
14          switch on the prior art emergency microphones without taking  
15          the eyes off the road.

16          3. Another objective of this invention is to provide a  
17          system where the need for push to talk switch in microphones  
18          is altogether obviated or used merely as a backup.

19          4. Another objective of this invention is to provide a  
20          low noise voice activated radio microphone switch that can  
21          operate reliably in high ambient noise.

22          5. Another objective of this invention is to provide an  
23          add on unit to existing radio microphone systems in emergency  
24          vehicles that can be easily interfaced.

25          6. Another objective of this invention is that it use  
26          little or no energy.

1           7. Another objective of this invention is that it can be  
2           used without detracting from the task of driving.

3           8. Another objective of this invention is that it be  
4           secure such that it recognizes the voice prints of a few  
5           authorized users in real time.

6           9. Another objective of this invention is that the system  
7           of this invention be compact, light weight and low cost.

8           10. Another objective of this invention is that the  
9           various components not interfere with the driver or the other  
10          components in the emergency vehicle..

11          11. Another objective of this invention is that the  
12          invention use modular standard components easily interface-  
13          able to each other.

14          12. Another objective of this invention is that it be  
15          reliable such that it practically never fails and requires  
16          little or no maintenance.

17          13. Another objective of this invention is that it is  
18          easy to use even intuitive requires little training if any and  
19          does not expect the driver to do any thing different and  
20          unusual or even unnatural.

21          14. Another objective of this invention is that it be  
22          environmentally safe.

23          15. Another objective of this invention is that it be  
24          physically safe in normal environment as well as accidental  
25          situations.

26



1           16. Another objective of this invention is that it meet  
2           all     federal, state, local and other private standards  
3           guidelines, regulations and recommendations with respect to  
4           safety, environment, energy consumption.

5           17. Another objective of this invention is that it  
6           provide both analog and digital outputs so that both digital  
7           and analog type transmitters can be activated with equal ease.

8           18. Another objective of this invention is that it be  
9           safe, fail-safe and fail-soft, stable, reliable secure and  
10          flexible.

11          19. Another objective of this system is that a stranger  
12          or any authorized person cannot accidentally turn on or off  
13          the microphone or enable or disable the system.

14          20. Another objective of this invention is that the  
15          driver or other authorized user cannot accidentally turn off  
16          the microphone or disable the system.

17          21. Another objective of this invention is that it use  
18          very little energy.

19          22. Another objective of this invention is that its  
20          design be streamlined and have a small footprint.

21          23. Another objective of this invention is that its  
22          design is aesthetic to blend with the decor of the emergency  
23          vehicle or other environment.

24          24. Another objective of this invention is that it not  
25          interfere with normal functions of the driver and the driving  
26          tasks.

1           25. Another objective of this invention is that it be  
2           adaptable for other primary and secondary uses without  
3           significant modifications.

4           26. Another objective of this invention is to facilitate  
5           and optimize under cover police work by obviating use of hand  
6           held mike and thereby making detection difficult if not  
7           impossible and reducing the chances of related injuries.

8           27. Another objective of this invention is to facilitate  
9           use of such radios and concomitant communications in ambulance  
10          cab section where hands of paramedic or other medical  
11          assistant are free to provide assistance to the patient  
12          without the use of hand held mike.

13          Other objectives of this invention reside in its  
14          simplicity, elegance of design, ease of manufacture, service  
15          and use and even aesthetics as will become apparent from the  
16          following brief description of the drawing and detailed  
17          description of the best mode embodiment.

18  
19          BRIEF DESCRIPTION OF THE DRAWING

20          The objects, features and advantages of the present  
21          invention and its application will be more readily  
22          appreciated when read in conjunction with the accompanying  
23          drawing , in which:

24  
25          a) FIG 1 is a system interface block diagram of the voice  
26          activated transmitter switch of this invention.

1           b) FIG 2 is a detailed block diagram of the voice  
2 activated transmitter switch of this invention.

3           c) FIG. 3 is a flow-chart of the voice activated  
4 transmitter switch of this invention.  
5

#### 6 DETAILED DESCRIPTION OF THE BEST MODE EMBODIMENT

7           As shown in the drawings wherein like numerals represent  
8 like parts throughout the several views, there is generally  
9 disclosed in Figure 1 a pair of microphones 10 generally 180  
10 degrees apart, the out put of which is applied to plus and  
11 minus inputs of a differential amplifier 20. The Output of the  
12 differential amplifier is then passed through an A/D converter  
13 30 and is then digitally processed in a digital processor 50  
14 to include phrase recognition such as "Key Mike" to engage and  
15 activate the transmission and "Over" to disengage and  
16 deactivate the transmitter 100. Also included are such  
17 features as phrase learning and training, auto time out and  
18 intelligibility processing.

19           Digital processor 50 also has on-board memory 55 to store  
20 sample voice prints as signatures of the authorized  
21 personnel. The speech recognition, conditioning and comparison  
22 circuit 110 of the processor 50 verifies by comparing  
23 envelopes and harmonics etc before activating the transmitter  
24 100. It should be noted that transmitters with digital  
25 interface receive the output of the digital process directly.  
26

1           The entire invention comprising the pair of microphones  
2           10, differential preamplifier 20, Codec 35 (which performs the  
3           functions of A/D converter 30 and D/A converter 40), and  
4           digital processor 50 is plug and interface compatible with the  
5           single existing microphone and the existing transmitter 100.

6           The analog signal from the mike 10 via differential  
7           preamplifier 20 can go directly to the transmitter 100 and the  
8           input to the A/D circuitry 30 (or codec 35) tapped off of it  
9           without severing the existing connection 22 between the  
10          microphone 10 (via differential preamp 20) and the transmitter  
11          100.

12          Alternatively the connection 22 between the microphone 10  
13          and the transmitter 100 can be severed and then is either  
14          reconverted back to analog via D/A converter 40 (or via codec  
15          35) or directly fed to a digital input of a transmitter with  
16          that capability. In either case additional digital processing  
17          via digital processor 50 is done to effect bandwidth spectrum  
18          balance, to alter intensity ratios, to improve intelligibility  
19          or other desired signal characteristics.

20          As shown in detailed block diagram Fig. 2 the invention  
21          comprises a pair of electret microphones 10 with differential  
22          pre-amps 20 to condition the signals for analog to digital  
23          converter 30 or codec 35 which is a linear codec commonly used  
24          in digital telephone systems. The data is then processed  
25          through a digital signal processor 50 which performs the voice  
26          recognition conditions and comparison function 110.

1 All this is under the control of a controller 120 which  
2 is a single CMOS microprocessor chip with plurality of I/O  
3 lines for interface as well as external address and data  
4 buses.

5 The program 150 for the controller 50 and the program  
6 routines 152 for the DSP 50 are stored in PROM 52. All the  
7 indicators 80 and switches 90 are also under the control of  
8 controller 120. For convenience all of said components are  
9 mounted on a single throw-away board, which allows the use of  
10 automated assembly techniques to used for fabrication and mass  
11 production.

12 All of the actions taken by the speech recognition  
13 circuit are accomplished under the control of the controller  
14 120, which monitors the external switches 90 and controls the  
15 indicators 80 as well as the transmitter 100. The controller  
16 120 further initialize the speech recognition circuits,  
17 initialize and monitors all of the registers of the  
18 microprocessor or DSP 50 for whatever function is being  
19 requested by the user through said switch 90. The controller  
20 120 can also select either conditioned speech, processed  
21 through the speech conditioning circuit or the analog audio  
22 from the microphone 10 can be patched directly to the  
23 transmitter 100.

24 As shown in Fig. 3 voice activated transmitter switch  
25 flow-chart after initialization 200 comprises plurality of  
26 decision blocks

- 1 a) Is stored command valid? - 210
- 2 b) Is switch pushed? - 220
- 3 c) Is calibration complete? - 230
- 4 d) Is calibration switch pushed? - 240
- 5 e) Is transmitter active? - 250
- 6 f) Does voice on command match? - 260
- 7 g) Does voice off command match? - 270
- 8 h) Has the voice time period exceeded? - 280

9 If the answer to the decision blocks 220 (Is button  
10 pushed?) and 240 (Is calibration switch pushed) is in  
11 the affirmative then capture patten function 222 and store  
12 captured data 224 are performed. If the answer to the decision  
13 block 240 (Is calibration switch pushed?) is in the negative  
14 then check switch status function 242 is performed.

15 If the answer to the decision block 260 (Does voice ON  
16 command match?) is in the affirmative then transmitter 100 is  
17 turned on via function 262. Similarly if the answer to the  
18 decision block 270 (Does voice off command match?) is in the  
19 affirmative then transmitter 100 is turned off via function  
20 272.

21 In the preferred embodiment the inventor used microphones  
22 10 Panasonic model WM-54BT. Differential pre-amps were  
23 implemented using single supply quad OP AMP LM324 which is an  
24 industry standard, which provides proper gain and conditioning  
25 for proper levels for codec 35 for which U-LAW/A-LAW PCM  
26 codec AT&T T-7500 was used.

1           For speech recognition function the inventor employed  
2           AT&T DSP16A1. The controller 120 was     8 bit Hitachi HD6305  
3           and RAM Module was SRAM Hitachi HN62256. Both of these and  
4           other components can be used by a person of average skill in  
5           the art with equal facility.

#### 6 7           OPERATION

8           The installation use and operation of this device is  
9           simple and even intuitive. The pair of microphones is mounted  
10          in the vehicle facing opposite of each other 180 degrees apart  
11          with a nominal distance of 10 to 12 inch space between the  
12          mouth of the driver and the microphones. The system is then  
13          trained with the On and off voice commands for each operator.  
14          The example of an ON command is "KEY-MIKE" An example of the  
15          OFF command is OVER.

16          By speaking the phrase taught for transmitter ON the  
17          turns on the transmitter and likewise by speaking the phrase  
18          taught for transmitter off, the transmitter turns off. Any  
19          speech that does not conform to the command phrases is  
20          ignored. Even command phrases by a different person are  
21          ignored. The command phrases by the same person having some  
22          change in voice due to cold etc are not ignored.

23  
24          To facilitate training the system a plurality of switches  
25          90 and plurality of indicator lights 80 are provided which are  
26          self explanatory as follows:

- 1 a) Active/Inactive switch 92
- 2 b) Learn Transmit On Command Switch 94
- 3 c) Learn Transmit OFF Command 96
- 4 d) Test Voice Command switch 98
- 5 e) LED Indicator Transmitter Active 82
- 6 f) LED Ready Indicator 84
- 7 g) LED Test/Learn Indicator 86

8 The first time a particular operator driver other user  
9 uses the unit, it has to be taught the phrases for ON and OFF  
10 in the voice of this particular driver, operator or other  
11 user. Obviously the operator must push the appropriate learn  
12 transmit switch 94 for On and 96 for OFF command. When said  
13 switch is pushed the test/learn indicator 86 begins to blink  
14 along with the transmitter active light 82.

15 After the operator, driver or other user has spoken the  
16 phrase, the ready indicator 84 is lit to indicate that the  
17 operator, driver or other user should repeat the phrase. When  
18 the phrase is repeated, the light turns off for a short period  
19 of time and then come back ON indicating that the phrase  
20 needs repeating again. The minimum number of utterances  
21 required.

22 Once the unit recognizes the calibration is satisfactory,  
23 the test/learn indicator 86 and the transmitter active  
24 indicator 82 is turned off and the READY indicator 84 begins  
25 to blink to indicate that the learning process is not complete  
26 until the transmitter OFF command has been taught to the unit.



1           The same procedure is used to train the transmitter off  
2           command. When all this is done, READY indicator 84 goes steady  
3           instead of blinking and all the other indicators 82,86 are  
4           turned off.

5           The switch 98 allows the user to test and verify the  
6           training without activating the transmitter 100. In this mode  
7           the test/learn indicator 86 is turned on steady (not blinking)  
8           and the transmitter indicator 82 responds to the voice  
9           commands without keying the transmitter 100.

10          The inventor has given a non-limiting description of the  
11          concept. Many changes may be made to this design without  
12          deviating from the spirit of the concept of this  
13          invention. Examples of such contemplated variations include  
14          the following.

15               a) A boom mike with very close coupling to the mouth of  
16               the user may be employed.

17               b) Some of the software functions may be employed by  
18               hardware.

19               c) Non-obvious enhancements may be made to the flow-chart  
20               described here.

21               d) The voice activated transmitter switch of this  
22               invention may be adapted for other applications such as the  
23               Citizen Band Radio.

24               e) The invention may be adapted for physically  
25               challenged.

26

1           f) A different type of energy source such as NICAD  
2 battery or solar energy source may be employed.

3           g) Complementary functions such as synthesized voice  
4 output instead of LED indicators may be used.

5           h) Different types of switches may be used.

6           i) An infra-red or RF3 link to the transmitter may be  
7 used which would also allow the maximum natural noise  
8 rejection and the use of relatively inexpensive standard VOX  
9 energy detectors to be used.

10          j) Logical operations to monitor activity in the  
11 emergency vehicle for the safety of the driver and others may  
12 be incorporated.

13  
14          Other changes such as aesthetic and substitution of newer  
15 materials as they become available which substantially  
16 perform the same function in substantially the same manner  
17 with substantially the same result without deviating from the  
18 spirit of this invention may be made.

19  
20          Following is a listing of the components and procedural  
21 steps used in this embodiment arranged in ascending order of  
22 the reference numerals for ready reference of the reader.

23           10    =    A pair of microphones such as PANSONIC WM-54BT.  
24           20    =    Differential Pre-amplifier such as LM324  
25           22    =    Connection between microphone 10 and  
26                   transmitter 100 via pre-amp 20

1	30	=	A/D converter
2	35	=	Codec U-LAW/A-LAW PCM such as AT&T T7500
3	40	=	D/A convertor
4	50	=	DSP such as AT&T DSP16A1
5	52	=	PROM
6	55	=	Memory 32 x 8 SRAM such as Hitachi HN62256
7	60	=	Transmitter on/off control device
8	62	=	Transmitter Key Signal
9	70	=	Transmitter Level shifting interface
10	72	=	Audio speech signal to transmitter modulator
11	80	=	Indicators
12	82	=	Transmitter active indicator
13	84	=	Ready indicator
14	86	=	Test/Learn indicator
15	90	=	Switches
16	92	=	Active/Inactive Switch
17	94	=	Learn Transmit On Command switch
18	95	=	Three way speech, conditioned speech and
19			inactive switch
20	96	=	Learn Transmit Off Command Switch
21	98	=	Test voice command switch
22	100	=	Transmitter
23	110	=	Speech recognition, conditioning and comparison
24	120	=	Controller 8 Bit such as Hitachi HD6305
25	150	=	voice activated transmitter switch
26			flow-chart/program

1           152 =     Program routines.  
2           200 =     Program initialization function  
3           210 =     Decision Block - Is stored command valid?  
4           220 =     Decision Block - Is switch pushed?  
5           222 =     Capture pattern function  
6           224 =     Store captured data  
7           230 =     Decision Block - Is calibration complete?  
8           240 =     Decision Block - Is calibration switch pushed?  
9           242 =     Check calibration switch status function  
10          250 =     Decision Block - Is transmitter active?  
11          260 =     Decision Block - Does voice on command match?  
12          262 =     Turn on transmitter 100 function  
13          270 =     Decision Block - Does voice off command match?  
14          272 =     Turn off transmitter 100 function  
15          280 =     Decision Block - Has the no voice time period  
16                    exceeded?

17

## 18       DEFINITIONS

19               While exacting care has been taken to avoid terms of art  
20       and use words with their conventional dictionary meaning  
21       the following definitions are included for clarification of  
22       the specification and its interpretation.

23               CPU - Central processing unit of a computer capable of  
24       performing all the timing, control, logic associated with  
25       running a computer program.

26

1           Driver - a software interface to match two or more  
2           dissimilar entities to make them compatible.

3           Interface - Matching or two or more dissimilar entities  
4           however realized

5           LED - Light emitting diode - a type of visual indicator

6           CODEC - Coder decoder performs the same function as A/D  
7           convertor + D/A converter.

8           Program - A computer program executable in a given  
9           computing environment.

10  
11           While this invention has been described with reference to  
12           illustrative embodiments, this description is not intended to  
13           be construed in a limiting sense. Various modifications and  
14           combinations of the illustrative embodiments as well as other  
15           embodiments of the invention will be apparent to person  
16           skilled in the art upon reference to this description. It is  
17           therefore contemplated that the appended claims will cover any  
18           such modifications, embodiments as fall within the true scope  
19           of the invention.

1 The inventors claim:

2 1. A voice activated transmitter switch comprising:

3 a) a voice input means;

4 b) a differential amplifier connected to said voice input  
5 means;

6 c) an analog to digital convertor connected to said  
7 differential amplifier;

8 d) a digital signal processor connected to said analog to  
9 digital convertor;

10 e) a digital to analog convertor connected to said  
11 digital signal processor and to the transmitter recited in the  
12 preamble; and

13 f) a transmitter key circuit connected to said digital  
14 processor and said transmitter.

15 2. The voice activated transmitter switch of claim 1  
16 wherein said voice input means comprises a plurality of  
17 microphones.

18 3. The voice activated transmitter switch of claim 1  
19 where in said voice input means comprises a pair of  
20 microphones 180 degrees apart the output of which is connected  
21 to plus and minus inputs of said differential amplifier.

22 4. The voice activated transmitter switch of claim 1  
23 where in said voice input means comprises a single electret  
24 microphone and where in said analog to digital convertor and  
25 said digital to analog convertor functions are realized by a  
26 codec.

1           5. The voice activated transmitter switch of claim 1  
2 wherein said digital processor performs inter alia the  
3 following functions:

- 4           a) speech recognition;
- 5           b) speech conditioning;
- 6           c) speech storage; and
- 7           d) speech comparison.

8  
9           6. A voice activated transmitter switch particularly  
10 adapted for use in an emergency vehicle communication system  
11 having a transmitter comprising:

- 12           a) a voice input means;
- 13           b) a differential amplifier connected to said voice input  
14 means;
- 15           c) a codec also known as a coder decoder which performs  
16 analog to digital and digital to analog functions;
- 17           d) a digital signal processor connected to said codec;
- 18           e) a transmitter key circuit connected to said digital  
19 processor and said transmitter.
- 20           f) a controller connected to said digital signal  
21 processor;
- 22           g) a plurality of switches connected to said controller;
- 23           and
- 24           h) a plurality of indicators connected to said  
25 controller.

1           7. The voice activated transmitter switch of claim 6  
2       where in said voice input means comprises a pair of  
3       microphones 180 degrees apart the output of which is connected  
4       to plus and minus inputs of said differential amplifier.

5  
6           8. The voice activated transmitter switch of claim 6  
7       wherein said digital processor performs inter alia the  
8       following functions:

- 9           a) speech recognition;  
10          b) speech conditioning;  
11          c) speech storage; and  
12          d) speech comparison.

13  
14          9. The voice activated transmitter switch of claim 6  
15       wherein said plurality of switches includes:

- 16          a) an active/inactive switch;  
17          b) a learn transmit on command switch;  
18          c) a learn transmit off command switch; and  
19          d) a test voice command switch;

20  
21          10. The voice activated transmitter switch of claim 6  
22       wherein said plurality of indicators include:

- 23          a) an LED indicator for indicating transmitter is active;  
24          b) an LED ready indicator; and  
25          c) an LED test/learn indicator.



11. A voice activated transmitter switch particularly adapted for use in an emergency vehicle communication system having a transmitter comprising:

- a) a voice input means;
- b) a differential amplifier connected to said voice input means;
- c) a codec also known as a coder decoder which performs the analog to digital and digital to analog functions;
- d) a microprocessor connected to said codec;
- e) a memory connected to said microprocessor;
- f) a controller connected to said microprocessor;
- g) a transmitter key circuit connected to said microprocessor and said transmitter;
- h) a transmitter level shifting interface connected to said transmitter and said codec; and
- i) a plurality of switches and indicators connected to said controller.

12. The voice activated transmitter switch of claim 11 wherein said microprocessor performs inter alia the following functions:

- a) speech recognition;
- b) speech conditioning;
- c) speech storage; and
- d) speech comparison.

1           13. The voice activated transmitter switch of claim 11  
2 wherein said plurality of switches and indicators includes:

- 3           a) an active/inactive switch;  
4           b) a learn transmit on command switch;  
5           c) a learn transmit off command switch;  
6           d) a test voice command switch;  
7           e) an LED indicator for indicating transmitter is active;  
8           f) an LED ready indicator; and  
9           g) an LED test/learn indicator.

10  
11           14. The voice activated transmitter switch of claim 13  
12 wherein said microprocessor is programmed to sense and make  
13 the following decisions:

- 14           a) Is stored command valid?;  
15           b) Is switch pushed?;  
16           c) Is calibration complete?;  
17           d) Is calibration switch pushed?;  
18           e) Is transmitter active?;  
19           f) Does voice on command match?;  
20           g) Does voice off command match?; and  
21           h) Has the voice time period exceeded?.

22           15. The voice activated transmitter switch of claim 11  
23 wherein said transmitter is turned on upon recognition of a  
24 pre-recorded phrase from a given speaker and turned off by  
25 recognition of a different prerecorded phrase from the same  
26 speaker.

1 16. The process of automatically activating a transmission in  
2 an emergency vehicle without the use a prior art push-to-talk  
3 microphone switch comprising the steps of:

4 a) recording and storing a first command for turning said  
5 transmission on;

6 b) recording and storing second and different command for  
7 turning said transmission off;

8 c) turning said transmission on when said first command  
9 is given; and

10 d) turning said transmission off when said second and  
11 different command is given.

12  
13 17. The process of automatically activating a  
14 transmission in an emergency vehicle of claim 16 wherein a  
15 micro-processor is programmed to sense and make the following  
16 decisions:

17 a) Is stored command valid?;

18 b) Is switch pushed?;

19 c) Is calibration complete?;

20 d) Is calibration switch pushed?;

21 e) Is transmitter active?;

22 f) Does voice on command match?;

23 g) Does voice off command match?; and

24 h) Has the voice time period exceeded?.

1/3

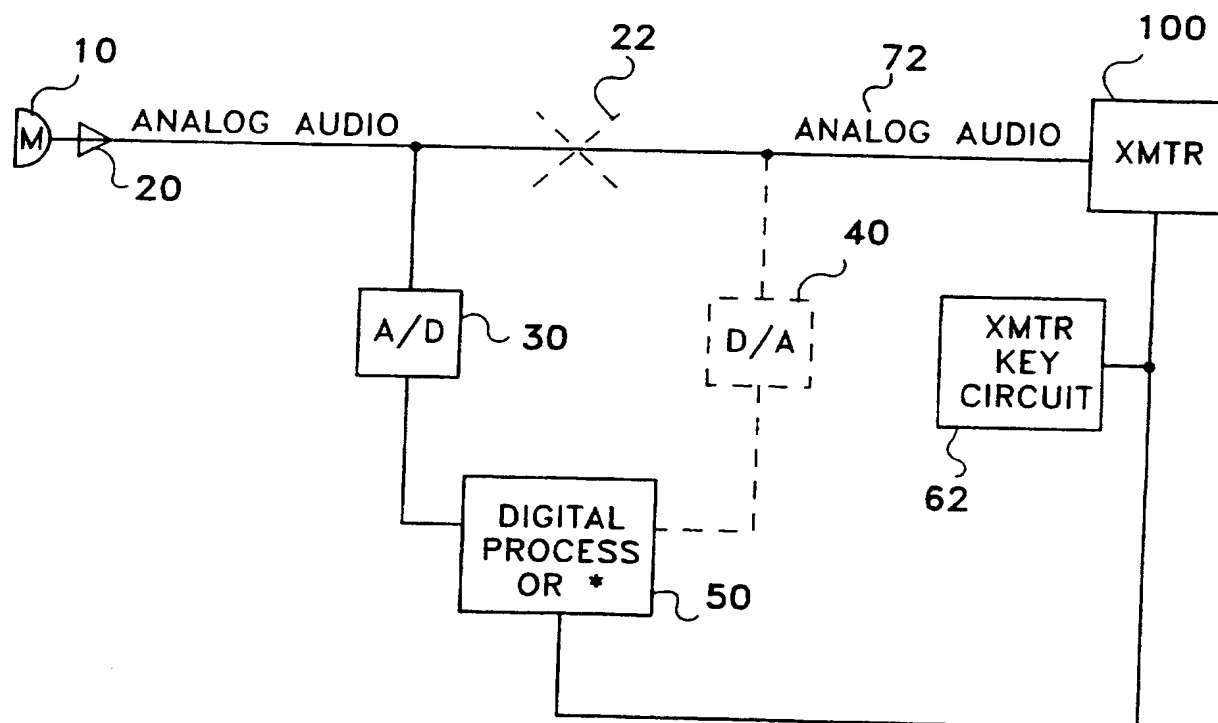


Fig. 1

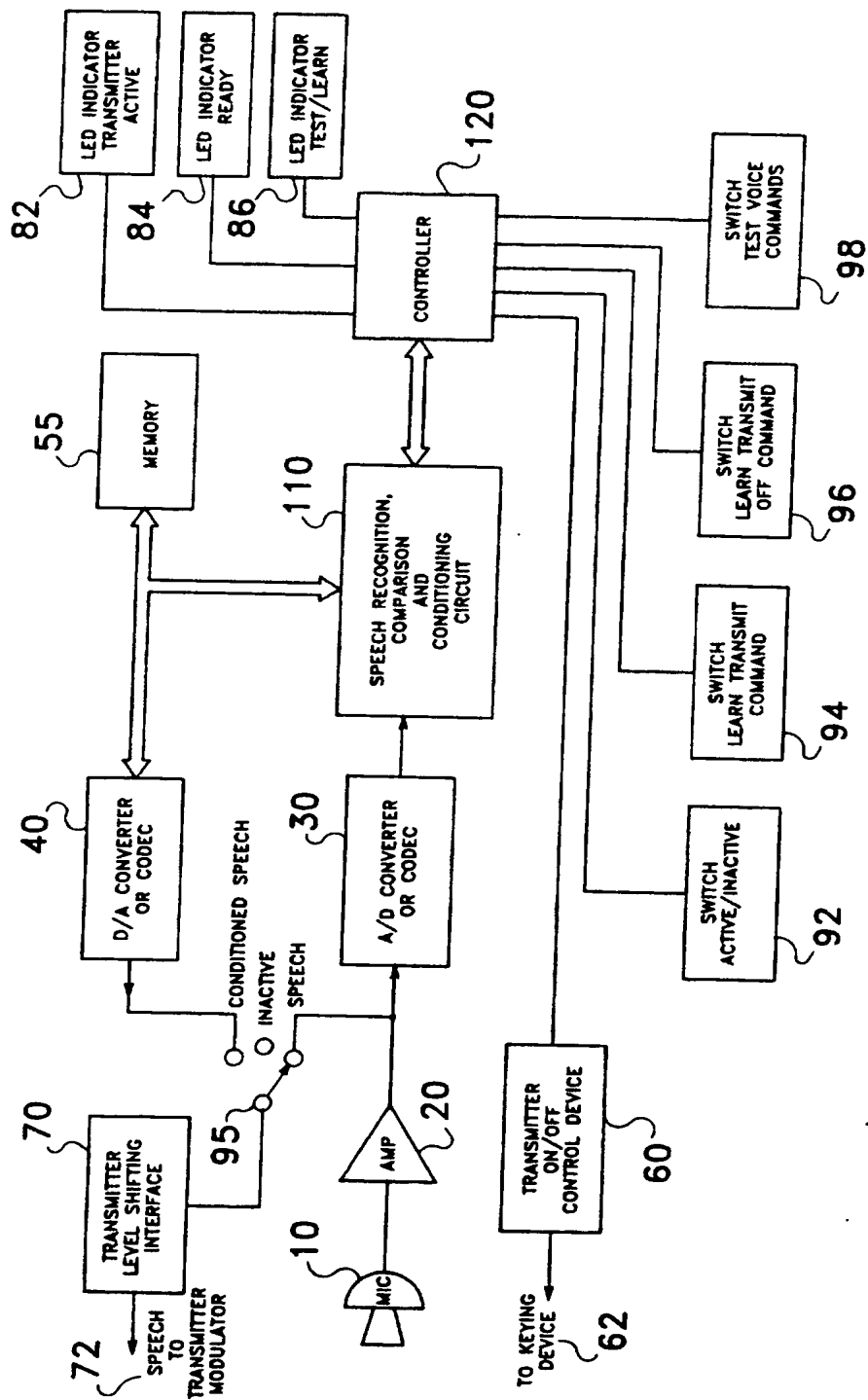


Fig.2

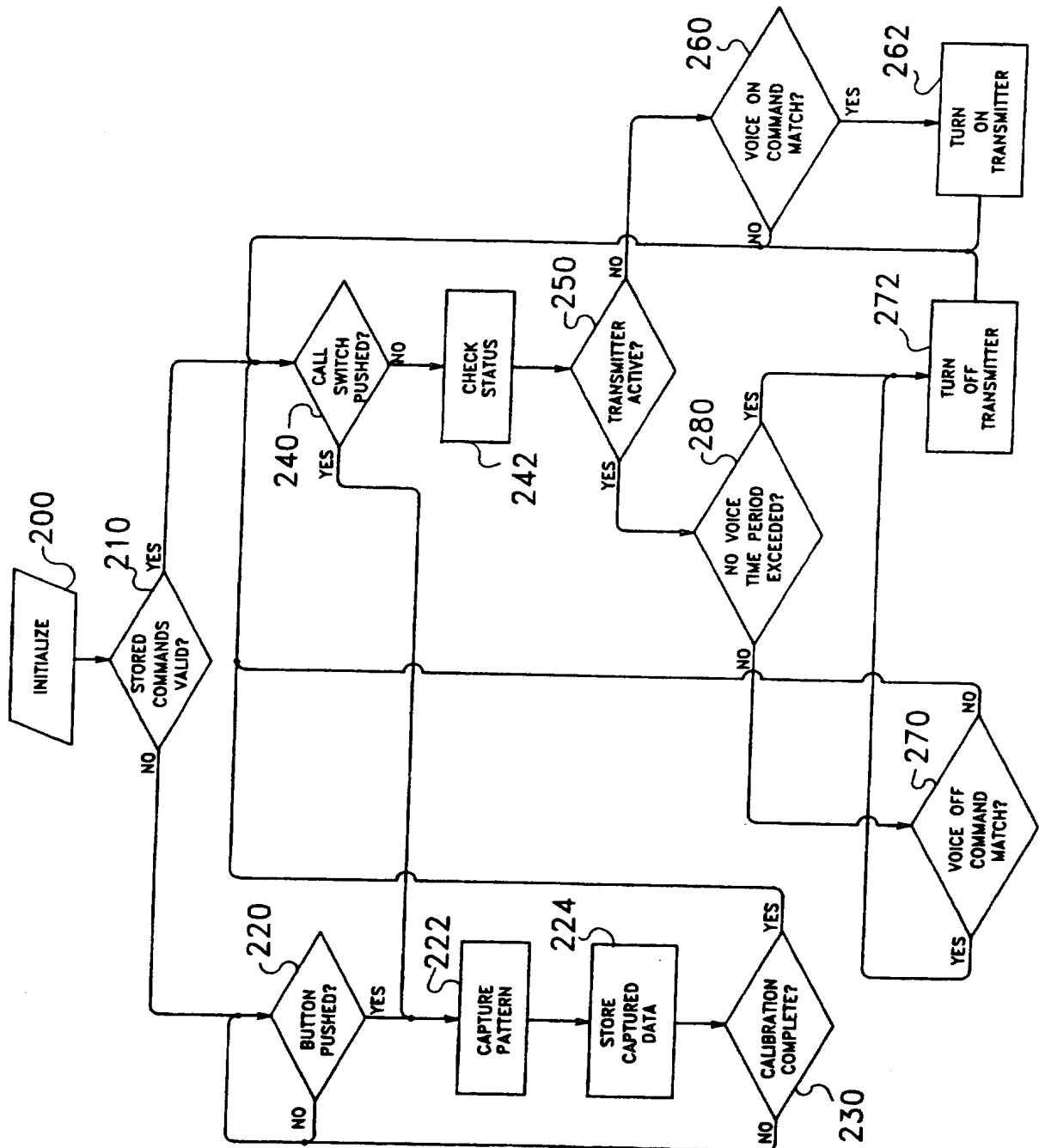


Fig.3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/12646

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : H03G 3/20; H04R 3/00; G10L 5/00, 7/00, 9/00, 5/06

US CL : 381/110, 36, 42; 395/2.55

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 381/110, 36, 42; 395/2.55, 2.6; 367/197, 198; 455/79, 116

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Extra Sheet.**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- Y	US, A, 5,267,323 (KIMURA) 30 NOVEMBER 1993, see figures 3-10, 20-24 and their descriptions.	1-3, 5 ----- 4, 6-15
Y	US, A, 5,152,007 (URIBE) 29 SEPTEMBER 1992, see figure 1, and column 2, line 37-column 3, line 7.	4, 6-15
X	US, A, 4,945,570 (GERSON) 31 JULY 1990, see figures 1-2, column 2, lines 43-61 and column 9-14, claims 1-43.	16-17

☐

Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be part of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G*	document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

26 DECEMBER 1995

Date of mailing of the international search report

16 FEB 1996

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/12646

## B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

APS.

Search terms: vox, voice activated switch, transmitter key, codec, voice recognition, speech recognition, LED displays, LED indicators, voice time period.